USER AUTHENTICATION IN A COMMUNICATION SYSTEM UTILIZING BIOMETRIC INFORMATION

FIELD OF THE INVENTION

This invention relates in general to the detection of fraudulent use of communications systems and, in particular, to fraudulent access by mobile users.

BACKGROUND OF THE INVENTION

Fraudulent access of cellular telephone systems is costly. Service providers lose money every year due to pirates accessing systems with stolen phones, and due to pirates using fraudulent equipment made to operate like legitimate phones.

Current techniques used in the art to detect fraudulent use include evaluating call patterns, called numbers, locations from which calls are placed, etc., and making comparisons against a user's historical activity. When anomalous behavior is recorded, fraudulent use is suspected. This allows service providers to detect fraudulent use only as a result of a change in a user's calling behavior, and while useful, is not very robust. If stolen phones stay in the area of their normal use, their pirated use may not be detected. Likewise, if fraudulent equipment that mimics a particular phone is used in the area normally occupied by the legitimate user, the pirated use may not be detected.

It would be desirable to robustly detect both types of pirated use outlined above. That is, it would be useful to detect either a pirate with a stolen phone, or the use of fraudulent equipment. What is needed is a method and apparatus for authenticating a particular cellular telephone, and verifying that it is being used by a valid user for that telephone.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a diagram of a communications system in accordance with a preferred embodiment of the present invention;

FIG. **2** shows a diagram of a node in a communications system in accordance with a preferred embodiment of the present invention;

FIG. **3** shows a diagram of a subscriber unit in accordance with a preferred embodiment of the present invention;

FIG. **4** shows a diagram of a test set in accordance with a preferred embodiment of the present invention;

FIG. **5** shows a flowchart of a method of authenticating a user and a subscriber unit in a communications system in accordance with a preferred embodiment of the present invention;

FIG. **6** shows a flowchart of a method of operating a subscriber unit in a communications system in accordance with a preferred embodiment of the present invention; and

FIG. **7** shows a flowchart of a method of operating a test set in a communications system in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Turning now to the drawings in which like reference characters indicate corresponding elements throughout the several views, attention is first directed to FIG. **1**. FIG. **1** shows a diagram of a communications system in accordance with a preferred embodiment of the present invention. Communications system **10** includes satellite **15**, satellite **20**, home gateway(HGW) **50**, visiting gateway(VGW) **40**, base station **35**, and public switched telephone network (PSTN) **60**. Also shown in communications system **10** are communications links **65**, **70**, **75**, **80**, **85**, and **90**, and user **25** with subscriber unit **30**.

Satellites **15** and **20** are preferably low earth orbit (LEO) satellites, but this is not a limitation of the present invention. In a preferred embodiment, satellites **15** and **20** are part of a larger constellation of LEO satellites. In addition, the functionality of satellites **15** and **20** can be combined into a single satellite while still practicing the present invention. For example, communications system **10** could include one or more geostationary orbit (GSO) satellites that provide the functionality of satellites **15** and **20**.

HGW **50**, VGW **40**, and base station **35** communicate with satellite **20** via communication links **90**, **85**, and **80**, respectively, as shown in FIG. **1**. The satellites, in turn, communicate with mobile user **25** via communication link **70**. The communication links in the exemplary embodiment of FIG. **1** show the gateways communicating with a single satellite and a single satellite communicating with a single mobile user. In a preferred embodiment, base station **35**, HGW **50**, and VGW **40** each communicate with multiple satellites, possibly simultaneously, and each satellite communicates with multiple mobile users. FIG. **1** shows that for mobile user **25** to communicate with HGW **50**, the communication link includes two satellites. In another valid configuration of the network, the link between mobile user **25** and HGW **70** includes three or more satellites, and in still another valid configuration, only one satellite is needed. Multiple valid configurations also exist in the link between mobile user **25** and base station **35**, and between mobile user **25** and VGW **40**.

One of many functions performed by base station **35**, HGW **50**, and VGW **40** is to network the communications system with PSTN **60**. When a call is placed through a satellite by mobile user **25**, the call is routed through the satellites to a gateway, and if the call is destined for a user in PSTN **60**, the gateway routes the call to PSTN **60**. If, on the other hand, the call is destined for another user within communications system **10**, the call may never be routed to PSTN **60**. Base station **35**, HGW **50**, and VGW **40** can communicate using terrestrial links or using satellite communication links such as the path created by links **80**, **85**, and **90**.

Subscriber unit **30** is typically a cellular telephone, but this is not a limitation of the present invention. Subscriber unit **30** can also be a data device, such as a modem, or any other device capable of transmitting into communications system **10**. Subscriber unit **30** can also be for use exclusively with terrestrial systems or satellite systems; however, in a preferred embodiment, subscriber unit **30** is a dual-use phone that operates with both terrestrial and satellite systems. The modulation format used by subscriber unit **30** is not a limitation of the present invention.

HGW **50** includes home location register (HLR) **55**. HLR **55** includes user profile information, and maintains billing information for user **25**. Home location registers are well known in the art of global system for mobile telecommunications (GSM). VGW **40** includes visiting location register (VLR) **45**. VLR **45** maintains user information while user **25** is roaming in the service area of VGW **40**. When a node in communications system **10** retrieves user information, it can come from HLR **55** or VLR **45**.

User **25** can access communications system **10** using either base station **35** or one of satellites **15** and **20**. For the